

CLAIMS

What is claimed is:

- 1     1.           A method of optimizing production from a formation without creating  
2           undue risk of mechanical instability of the formation, comprising:  
3  
4                sensing a bottom hole flowing pressure;  
5  
6                comparing the bottom hole flowing pressure to a stability envelope for the  
7           formation; and  
8  
9                adjusting fluid production to maintain the bottom hole flowing pressure  
10          within a desired region of the stability envelope.
- 1     2.          The method as recited in claim 1, further comprising adjusting a sensor sampling  
2           rate as a function of the position of the bottom hole flowing pressure in the  
3           stability envelope.
- 1     3.          The method as recited in claim 1, wherein sensing comprises sensing the bottom  
2           hole flowing pressure repeatedly and periodically.
- 1     4.          The method as recited in claim 1, wherein comparing comprises utilizing a  
2           computerized device to automatically compare the bottom hole flowing pressure  
3           to the stability envelope.
- 1     5.          The method as recited in claim 1, wherein adjusting comprises adjusting a valve  
2           to change the fluid production rate.

- 1 6. The method as recited in claim 1, wherein adjusting comprises adjusting a choke  
2 to change the fluid production rate.
- 1 7. The system as recited in claim 1, wherein adjusting comprises adjusting an  
2 artificial lift mechanism to change the fluid production rate.
- 1 8. A method of optimizing production from a formation, comprising:  
2  
3 comparing a bottom hole flowing pressure to a reservoir pressure in real-  
4 time to determine an underbalance as a fluid is produced from the formation; and  
5  
6 continuously adjusting the bottom hole flowing pressure to maintain the  
7 level of underbalance in proximity to a predetermined maximum underbalance for  
8 a measured reservoir pressure.
- 1 9. The method as recited in claim 8, wherein comparing comprises continuously  
2 sensing the bottom hole flowing pressure and the measured reservoir pressure.
- 1 10. The method as recited in claim 9, wherein continuously sensing comprises  
2 periodically sensing the bottom hole flowing pressure.
- 1 11. The method as recited in claim 9, wherein continuously sensing comprises using a  
2 downhole pressure sensor to determine the bottom hole flowing pressure.
- 1 12. The method as recited in claim 8, wherein continuously adjusting comprises  
2 automatically adjusting the production flow rate of the fluid.
- 1 13. The method as recited in claim 12, wherein adjusting the production flow rate  
2 comprises adjusting a valve.

- 1 14. The method as recited in claim 12, wherein adjusting the production flow rate  
2 comprises adjusting a choke.
- 1 15. The method as recited in claim 12, wherein adjusting the production flow rate  
2 comprises adjusting an artificial lift mechanism.
- 1 16. A system for optimizing production from a formation, comprising:  
2  
3 a completion deployed in a wellbore, the completion having a flow control  
4 mechanism able to control the rate at which a fluid is produced through the  
5 wellbore;  
6  
7 a reservoir pressure sensor;  
8  
9 a bottom hole flowing pressure sensor; and  
10  
11 a stability envelope for the formation, wherein the flow control  
12 mechanism is adjustable to maintain the ratio of bottom hole flowing pressure to  
13 reservoir pressure within a specific region of the stability envelope.
- 1 17. The system as recited in claim 16, wherein the flow control mechanism comprises  
2 an artificial lift mechanism.
- 1 18. The system as recited in claim 16, further comprising a computerized controller to  
2 receive signals from the reservoir pressure sensor and the bottom hole flowing  
3 pressure sensor and to automatically adjust the flow control mechanism based on  
4 the signals received.
- 1 19. The system as recited in claim 16, wherein the flow control mechanism comprises  
2 a valve.

- 1 20. The system as recited in claim 17, wherein the flow control mechanism comprises  
2 a choke.
- 1 21. The system as recited in claim 16, further comprising a control system to compare  
2 the reservoir pressure and the bottom hole flowing pressure to the stability  
3 envelope and to automatically adjust the bottom hole flowing pressure.
- 1 22. A method of optimizing production of a fluid from a formation without  
2 incurring sanding due to mechanical instability of the formation, comprising:  
3  
4 monitoring in real-time a reservoir pressure of the formation and a bottom  
5 hole flowing pressure proximate a production completion; and  
6  
7 periodically adjusting the ratio of bottom hole flowing pressure to  
8 reservoir pressure to maintain the ratio at a desired position relative to a  
9 predetermined line representative of the maximum pressure ratio underbalance for  
10 the formation.
- 1 23. The method as recited in claim 22, wherein monitoring comprises utilizing a  
2 downhole pressure sensor.
- 1 24. The method as recited in claim 22, further comprising deploying a completion in a  
2 wellbore to control production of the fluid.
- 1 25. The method as recited in claim 24, wherein deploying comprises suspending the  
2 completion on a tubing through which the fluid is produced.
- 1 26. The method as recited in claim 22, wherein deploying comprises deploying a  
2 completion having a flow control mechanism adjustable to control a production  
3 rate and the bottom hole flowing pressure.

- 1 27. The method as recited in claim 22, wherein periodically adjusting comprises  
2 automatically adjusting the bottom hole flowing pressure.
- 1 28. The method as recited in claim 22, further comprising adjusting a sensor sampling  
2 rate as a function of the ratio of bottom hole flowing pressure to reservoir  
3 pressure.
- 1 29. A system for optimizing production of a fluid from a formation without  
2 incurring sanding due to mechanical instability of the formation, comprising:  
3  
4 means for monitoring a reservoir pressure of the formation and a bottom  
5 hole flowing pressure proximate a production completion; and  
6  
7 means for periodically adjusting the ratio of bottom hole flowing pressure  
8 to reservoir pressure to maintain the ratio at a desired position relative to a  
9 predetermined line representative of the maximum pressure ratio underbalance for  
10 the formation.
- 1 30. The system as recited in claim 29, wherein the means for monitoring comprises a  
2 pressure sensor.
- 1 31. The system as recited in claim 29, wherein the means for periodically adjusting  
2 comprises a flow control mechanism by which bottom hole flowing pressure is  
3 changed.